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(54) **Electrical connector.**

(57) An electrical connector has an improved multi-function lock means which comprises a first lock piece (50) having a thumb-operated release lever (68) to facilitate unlatching the electrical connector (10) from a mating electrical connector (14), and a second lock piece (90) having a trigger grip (80) to facilitate disconnecting the unlatched electrical connector from the mating electrical connector.

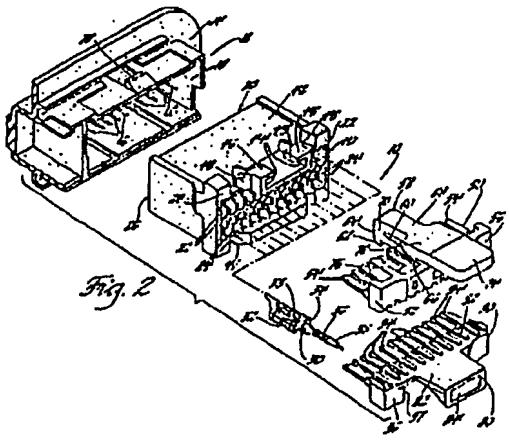

Fig. 2

EP 0 189 979 A1

ELECTRICAL CONNECTOR

This invention relates generally to an electrical connector as specified in the preamble of claim 1, for example as disclosed in US-A-4 433 888.

It is already known from the said US-A-4 433 888 for an electrical connector to include a separate lock piece which is multi-functional, that is, a lock piece which when attached to a connector body not only prevents the withdrawal of the respective sets of terminals but also provides a latch arm for securing the connector body to a mating electrical connector.

The present invention is concerned with an electrical connector having an improved multi-function lock means which is designed to facilitate unlatching the electrical connector and disconnecting it from a mating electrical connector.

To this end an electrical connector in accordance with the present invention is characterised by the features specified in the characterising portion of claim 1.

The release lever of the multi-function lock means is preferably thumb-operated for unlatching the electrical connector from the mating electrical connector body.

The multi-function lock means may also include a trigger grip so that the electrical connector may be unlatched and disconnected from the mating electrical connector with one hand.

In the drawing:

Figure 1 is a fragmentary longitudinal section of mated electrical connectors including a preferred embodiment of an electrical connector having an improved multi-function lock means in conformity with the present invention;

Figure 2 is an exploded perspective view of the electrical connectors shown in Figure 1; and

Figure 3 is a perspective view of a lower lock piece of Figures 1 and 2 shown in an upside-down position.

With reference now to the drawing, the present invention is illustrated as being embodied in an electrical connector 10 which is connected and latched to a mating electrical connector 12, which in this particular instance is a header connector 14 having a plurality of pin terminals 16. The header connector 14 is attached to a printed circuit board, not shown, and the tails of the pin terminals 16 are soldered to various conductor strips of the circuit board, for instance as shown in EP-A-83 30 3930.8.

The contact ends of the pin terminals 16 project into a socket 18 of the header connector 14 which is shaped to receive a connector body 20 of the electrical connector 10 in accordance with the present invention.

The connector body 20 has an upper row of terminal cavities 22 and a lower row of terminal cavities 24 which extend through the connector body 20 in a longitudinal direction from its contact end 26 to its conductor end 28.

Each of the terminal cavities 22 of the upper row is shaped to receive and retain a socket terminal 30 of the type shown and described in US-A-4 448 477.

Briefly, the terminal 30 comprises a socket 32 adapted to receive the conductor end of one of the pin terminals 16, a latch finger 33, a lock ear 34 and a crimp barrel 36 for attaching the socket terminal 30 to an electrical conductor 38.

Each of the terminal cavities 24 of the lower row is also shaped to receive and retain a socket terminal 30. It should be noted, however, that the socket terminals 30 are inserted into the cavities 24 of the lower row in an upside-down position from that shown in Figures 1 and 2. The shape of the cavities 24 of the lower row is thus correspondingly upside-down in comparison to the shape of the cavities 22 of the upper row.

The connector body 20 has a C-shaped channel 40 on its upper wall 42 at the conductor end 28 of the connector body 20. The C-shaped channel 40 defines a T-shaped slot comprising a centre slot 43 and side slots 44 under side pieces 46 which form flange pieces of the T-shaped slot and serve as fulcrums as explained below. Each side of the C-shaped channel 40 has a lock nib 48.

The multi-function lock means in conformity with the present invention comprises a separate lock piece 50 which includes a lock board 52 that has one end slotted to provide a plurality of individual fingers 54. These fingers enter the conductor ends of the terminal cavities 22 for disposal behind the respective lock ears 34 of the terminals 30 when the lock piece 50 is attached cross-wise of the terminal cavities 22 as shown in Figure 1. The opposite end of the lock board 52 has a flange 56 to which a U-shaped member 58 is attached. The U-shaped member 58 comprises a latch arm 60 which is attached at one end to the flange 56 and extends forwardly in cantilever fashion over the lock board 52 in the direction of the fingers 54 and has a depending latch nib 62 at its opposite free end 64. The end portion 66 of the latch arm 60 adjacent the flange 56 is wider than the centre slot 43, so that the outside

edges are trapped inside the side pieces (fulcrums) 46 of the C-shaped channel 40 when the lock piece 50 is attached to the connector body 30 as shown in Figure 1.

The U-shaped member 58 further comprises a release lever 68 which is connected to the free end of the latch arm 60 by a bight 70 so that the release lever 68 extends back over the latch arm 60 with a space therebetween for receiving the side pieces 46, as shown in Figure 1. The release lever 68 has a wide mid-portion 72 which is wider than the centre slot 43 so that it engages the side pieces 46 on either side of the centre slot 43. The release lever 68 also has a corresponding wide end portion 74 which serves as a thumb pad that is located rearwardly of the side pieces 46 and the attached end portion 66 of the latch arm 60 so that the latch nib 62 moves away from the connector body 20 when the thumb pad 74 is depressed.

The separate lock piece 50 also has two short latch arms 76 projecting forwardly from the flange 56 on either side of the U-shaped member 58 for engaging the lock nibs 48 to secure the separate lock piece 50 to the connector body 20.

After the terminals 30 have been inserted into the terminal cavities 22 and retained therein by the latch tangs 33, the separate lock piece 50 is then attached to the connector body 20 by inserting the fingers 54 into the conductor ends of the terminal cavities 22 until the short latch arms 76 snap past the lock nibs 48 to secure the lock piece 50 in the attached position shown in Figure 1. In this attached position, the fingers 54 are disposed behind the lock ears 34 of the respective terminals 30 in the cavities 22 to provide a solid lock which

prevents withdrawal of the terminals 30 from the cavities 22, and the wide end portion 66 of the latch arm 60 is trapped beneath the side pieces 46, thereby positioning the latch arm 60 so that the latch nib 62 engages behind the co-operating lock nib 78 of the header connector 14 under the force of a bending moment when the two electrical connectors are subsequently connected and latched together as shown in Figure 1. The electrical connectors 10 and 12 may be unlatched simply by depressing the release lever 68 at the thumb pad 74.

The multi-function lock means in conformity with the present invention may also include a trigger grip 80 to assist in unlatching and disconnecting the electrical connector 10 from the electrical connector 12.

The trigger grip 80 is connected to the connector body 20 so that it extends rearwardly of the connector body 20 generally parallel to and about 25 to 50 mm (an inch or two) below the U-shaped member 58 so that the thumb pad 74 and trigger grip 80 may be engaged by one hand of an operator for releasing the latch nib 62 and disconnecting the electrical connector 10 from the electrical connector 12. More specifically, the trigger grip 80 comprises an extension 82 and a depending triangular finger piece 84 at the end of the extension. The index finger of the operator is wrapped around the finger piece 84 and the thumb pad 74 is depressed, which releases the latch nib 62 as indicated above. The released electrical connector 10 remains firmly gripped by the operator so that it may be disconnected from the electrical connector 12 simply by pulling the electrical connector 10 out of the socket 18.

In instances where the electrical connector 10 is of the double-row type, the trigger grip 80 may be incorporated into a second separate lock piece 90 for the terminals 30 which are disposed in the terminal cavities 24 of the lower row.

Like the lock piece 50, the lock piece 90 also includes a lock board 92 which has one end slotted to provide a plurality of individual fingers 94 that are disposed behind the respective lock ears 34 of the terminals 30 in the terminal cavities 24 when the lock piece 90 is attached cross-wise of the terminal cavities 24, as shown in Figure 1. The opposite end of the lock board 92 likewise has a flange 96 to which two short latch arms 98 are attached so as to project forwardly for engaging co-operating lock nibs 41 depending from the lower wall of the connector body 20 to secure the second lock piece 90 to the connector body 20. The trigger grip 80 also extends from the opposite end of the lock board 92 in line with a large central slot 97 which extends through the flange 96 to facilitate moulding the lock nibs 99 on the ends of the short latch arms 98 and the finger piece 84 on the end of the extension 82.

The lock pieces 50 and 90 retain the terminals in the cavities and secure their respective lock boards to the connector body in substantially the same way and are constructed substantially identically in this regard. The second lock piece 90 and the trigger grip 80 incorporated therewith are shown upside-down in Figure 3 to better illustrate the second lock piece 90 and demonstrate the similarity to the lock piece 50.

Claims:

1. An electrical connector comprising a connector body (20) having a row of terminal cavities (22) and a plurality of terminals (30) disposed in the respective terminal cavities (22) of the said row, and multi-function lock means for preventing withdrawal of the terminals (30) disposed in the row of terminal cavities (22) and for latching the connector body (20) to a mating electrical connector (12), characterised in that the multi-function lock means comprises a separate lock piece (50) which includes a lock board (52) that is disposed cross-wise of the row of terminal cavities (22) and has an end portion (54) thereof disposed in the terminal cavities (22) at a conductor end of the connector body (20) to prevent withdrawal of the terminals (30) disposed therein, the lock piece (50) further comprising a U-shaped member (58) including a latch arm (60) which is attached at one end to the opposite end portion (56) of the lock board (52) and extends forwardly in cantilever fashion over the lock board (52), the said latch arm having a latch nib (62) at its opposite free end, the U-shaped member (58) further including a release lever (68) which is connected to the opposite free end of the latch arm (60) by a bight (70) and extends back over the latch arm (60) with a space therebetween, and the lock piece (50) having means (76) for attaching the lock piece (50) to the connector body (20).

2. An electrical connector according to claim 1, characterised in that the end portion (54) of the separate lock piece (50) is disposed at a rearward end of the connector body (20), the release lever (68) has a thumb pad (74) at its free end which

is located rearwardly of the attached end of the latch arm (60), and a trigger member (80) is connected to the connector body (20) so that it extends rearwardly of the connector body (20) generally parallel to the U-shaped member (58) such that the trigger member (80) and the thumb pad (74) may be engaged by the index finger and thumb of one hand of an operator for releasing the latch nib (62) and disconnecting the electrical connector (10) from a mating electrical connector (12).

3. An electrical connector according to claim 2, characterised in that the release lever (68) has a mid-portion thereof engaging a fulcrum (46) of the connector body (20), the thumb pad (74) has its free end located rearwardly of the fulcrum (46) so that the latch nib (62) moves away from the connector body (20) when the thumb pad (74) is depressed, and the trigger member (80) comprises a trigger grip.

4. An electrical connector according to claim 3, characterised in that the connector body (20) has a C-shaped channel (40) which defines a T-shaped slot comprising a centre slot (43) and side slots (44) under flange pieces (46) of the C-shaped channel (40), and the latch arm (60) has a widened end portion (74) adjacent a flange (56) which is trapped beneath the flange pieces (46) of the C-shaped channel (40), with the flange pieces (46) serving as the fulcrum engaged by the mid-portion of the release lever (68).

5. An electrical connector according to claim 1, characterised in that the connector body (20) has a first row and a second row of terminal cavities (22) as aforesaid and a plurality of terminals (30) as aforesaid disposed in the

respective terminal cavities (22) of the said rows, the said multi-function lock means is effective to prevent withdrawal of the terminals (30) disposed in the rows of terminal cavities (22) as well as latching the connector body (20) to a mating electrical connector (12), and the said multi-function lock means comprises a first lock piece (50) as aforesaid which includes a first lock board (52) that is disposed cross-wise of the first row of terminal cavities (22) and has an end portion disposed in the terminal cavities of the first row at a rearward end of the connector body (20) to prevent withdrawal of the terminals (30) disposed therein, the said first lock piece (50) further comprising a U-shaped member (58) as aforesaid including a latch arm (60) as aforesaid which is attached to the opposite end portion (56) of the first lock board (52) and extends forwardly in cantilever fashion over the first lock board (52), with the latch nib (62) being disposed at the opposite free end of the said latch arm (60), and a second lock piece (90) includes a second lock board (92) which is disposed cross-wise of the second row of terminal cavities (22) and has an end portion disposed in the terminal cavities (22) of the second row at the rearward end of the connector body (20) to prevent withdrawal of the terminals (30) disposed therein, the said multi-function lock means having means for attaching both the first and second lock boards (52,92) to the connector body (20), and the second lock piece (90) further including a trigger grip (80) having an extension with a depending finger piece (84) at the free end thereof, the said extension being attached to the opposite end portion of the second lock board (92) and extending rearwardly of the connector body

(20) generally parallel to the U-shaped member (58) so that the finger piece (84) and a thumb pad (74) provided on the U-shaped member (58) may be engaged by the index finger and thumb of one hand of an operator for releasing the latch nib (62) and disconnecting the electrical connector (10) from a mating electrical connector (12).

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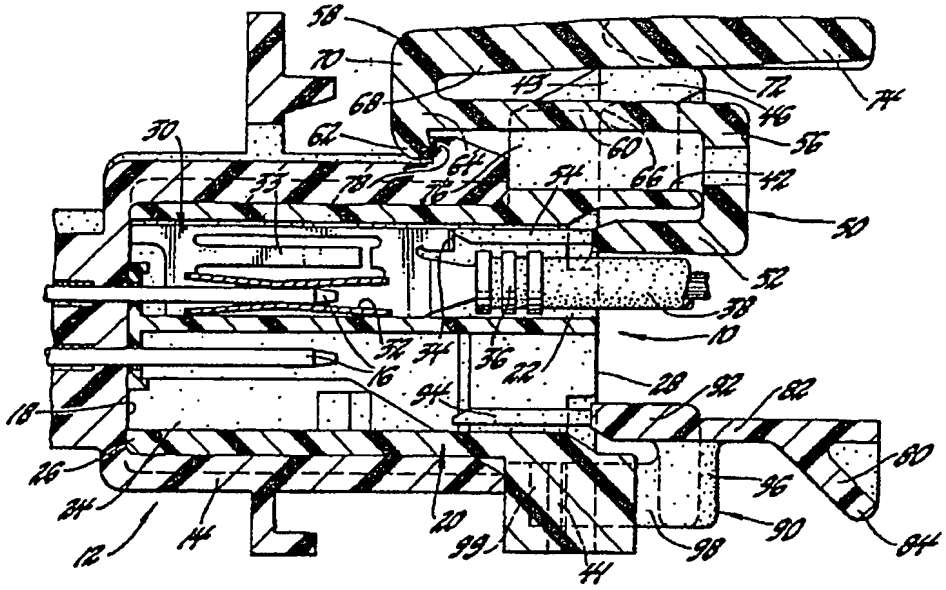

Fig. 1

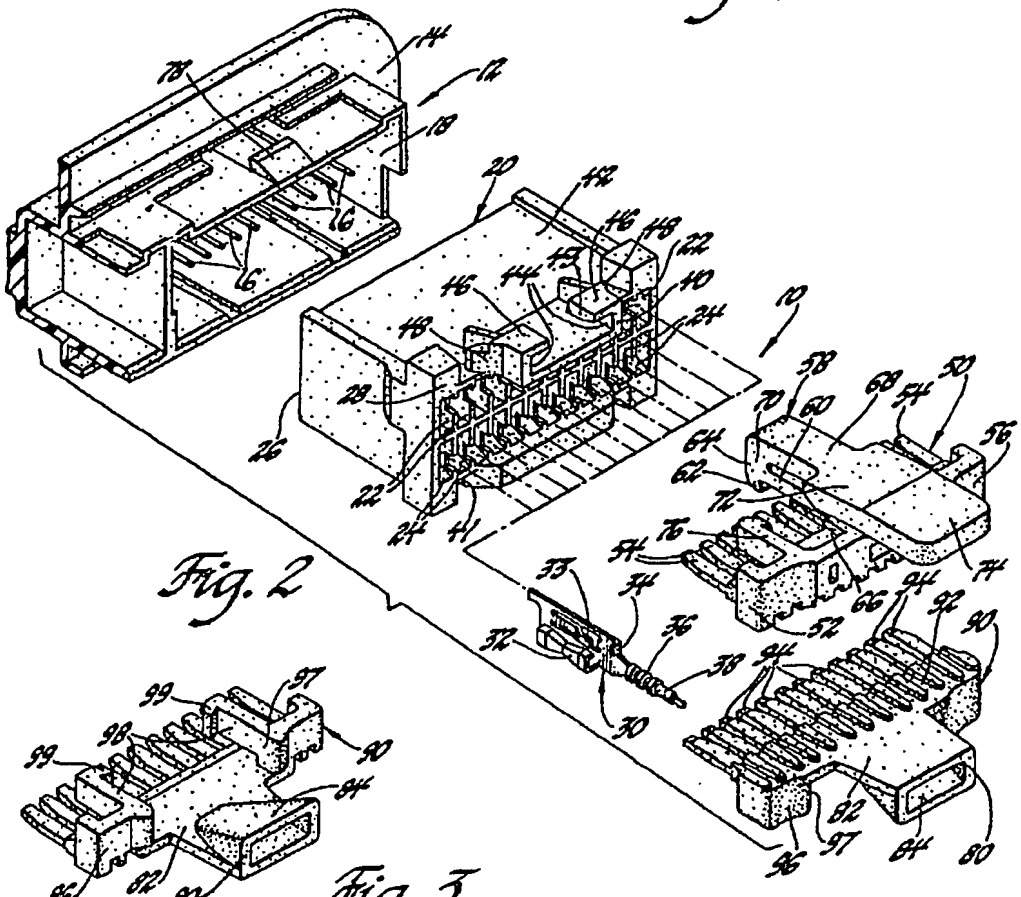

Fig. 2

Fig. 3

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EUROPEAN SEARCH REPORT

0189979
Application number

EP 86 30 0153

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
A,D	US-A-4 433 888 (J.L. WINGER) * figure 1; column 1, lines 28-68 *	1	H 01 R 13/639 H 01 R 13/436
A	US-A-4 376 563 (S.G. MARGRAVE et al.) * figures 1, 2; column 1, lines 35-43; column 2, line 55 - column 3, line 11 *	1	
A	FR-A-2 468 225 (SOCIETE DE SIGNALISATIONS AUTOMOBILES SEIMA) * figure 1; page 2, lines 28-30 *	1	

TECHNICAL FIELDS SEARCHED (Int Cl 4)

H 01 R 13/00
H 01 R 23/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	11-04-1986	LEOUFFRE M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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